GUIDING THE AUTOMATION AND AI REVOLUTION: WHAT THE RISE IN AUTOMATION MEANS FOR SHIFTING STANDARDS OF HUMAN VALUE AND OUR SOCIETAL STRUCTURE

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Abstract

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Abstract: The automation revolution is inevitable; however, this technology does not have to be our destiny. Traditionally, the idea of automation has been associated with replacing human jobs; however, through deliberate implementation it can be used to empower human beings. The impact of the rise in automation depends on how the technology is adopted by individuals, a human-centric approach from employers, and policy responses to inherent shifts in societal structures and economic systems.

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I. Introduction

A Framework for Understanding the Future of Automation

Recent decades have showcased a, previously unimaginable, rise in adoption, proliferation, and advancements of automation. Breakthroughs in artificial intelligence (AI) and machine learning have re-invented the way society goes about computing, communicating, sensing, etc. These continual advancements have broadened the horizon of automation, beyond basic mechanized labor, to include knowledge work and tasks which typically require advanced skills such as adapting to unforeseeable variables. Machines have been historically useful for displacing redundant tasks and routine activities. Now they are being employed to make complex judgements and solve problems that previously required human intelligence and comprehension. The rise of automation is definitive; however, the technology is not the destiny. As automation becomes more prevalent, the ethical issues surrounding societal norm disruption creates divisive opinions on whether this rise should be mitigated or controlled. There is lingering fear and/or excitement around the question of what the evolving dependency and advancements of technology mean for the future of the American economy and traditional social structure. The impact of the rise in automation depends on how the technology is adopted by individuals, a human-centric approach from employers, and policy responses to inherent shifts in societal structures and economic systems.

The rise of "knowledgeable automation" is vastly different from the manufacturing automation previously known to man. In the past, manufacturing automation had predictable displacement effects as the impact to employment, productivity, and economy were clearly linked to the machine's ability to cut production time and increase efficiency. However, the

effects of a knowledgeable automation will be more profound – as programmable robots can potentially replace human intelligence and understanding. Although the complete substitution by human jobs is unforeseeable in the near future, worker displacement, requirement for new skills, and demand for evolved employee-employer relations are inevitable (Atkinson, 2017).

A report from the National Academies of Sciences, Engineering, and Medicine discusses the impacts of technological trends on social and economic developments. The report emphasizes not only the impact of automation but what specifically drives these impacts. It is not simply the development of technology but rather the choices made around the adoption and integration is what drives the respective impact. "The net impact of technology, mediated by the decisions of many organizations (businesses, governments, and philanthropic entities) and individuals, is multifaceted. Its full impact is not predetermined, but will depend on the decisions of governments, companies, and individuals about how to use technology and how to prepare for or respond to associated shifts in the economic or social landscape." (NASEM 2017, pg. 138) The report notes the advancement of the internet as an example of our evolution and adoption of a technological advancement. The development of the internet paved the way for increased communication and globalization, which was predictable. However, the eventual outsourcing and offshoring of business work was less predictable. These organizational decisions to extend the technology in this manner fundamentally shifted the power structures and eventual outcomes for the workforce and economy. This historical example highlights that although the technological advancements associated with automation have created lower unemployment ratios, income inequality, and major societal discomfort, it is not just the technologies themselves that create impacts but rather the application and choices made around these developments.

Similar ideals are reported in the IEE Standards Association introduction of the Global Initiative for Ethical Considerations in the Design of Autonomous Systems. This report explores the need for building a consensus around conduct and standards regarding the ethical implementation of advanced technologies (IEEE, 2016). This initiative calls on those who are involved in the implementation of developed technologies to "place human well-being, empowerment, and prosperity at the core of their pursuits, and to ensure that technology choices are "-thoroughly scrutinized for social costs and advantages that will also increase economic value for organizations by embedding human values in design" (IEEE 2016, p. 36).

When moving forward with automation there are two critical considerations that must be made when using automation to drive societal good: (1) humans should remain central to the workplace in the future and (2) automation, artificial intelligence, and related technologies should remain tools to *enrich* human lives and livelihood (NAE, 2018). It is first imperative to understand the nature of automation today, how it came about, and what current trends can be used to predict the future approaches to automation.

Understanding the Levels of Automation

The ultimate goal of automation is to reach a point in which robotics and technology are not just replacing tasks but actually adding unforeseen value to society – giving more than its taking. The ideal path to achieving this goal is through socially responsible automation (SRA) which is attainable based on historical trends and technological advancements. It is attainable through deliberate and conscious incorporation of these technologies into the daily lives of humans, business operations, and integration with the value-add that humans inherently possess. The following SRA pyramid (Figure 1) breaks down automation into four levels and showcases

how to guide automation integration and strategy development to attain the goal of SRA. (NASEM, 2017)

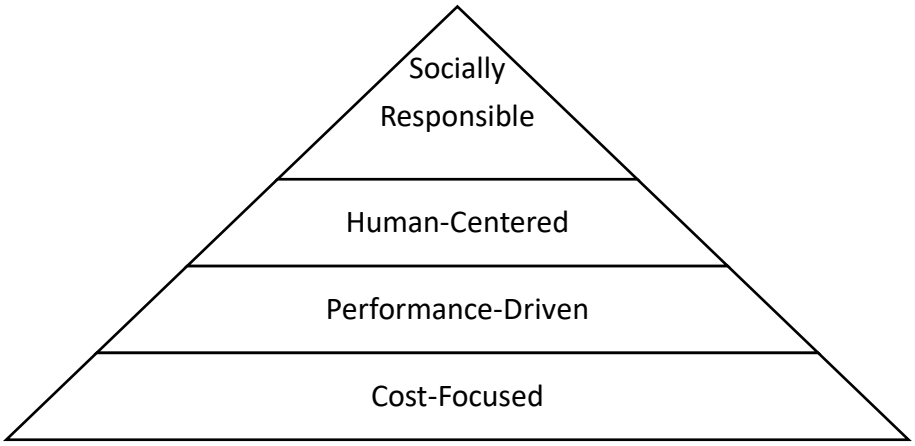

Figure 1: SRA Pyramid

Level 0: Cost Focused Automation

At the lowest and most basic level of automation, economic benefits from simple labor reduction drives technological and implementation decisions. In this instance, cost-based programs completely ignore social and human impacts. Additionally, they often fail to deliver the intended business interests or are unsustainable in the long term. An example of this basic level of automation is in the business process outsourcing (BPO) industry. This industry relies on the core business model of labor arbitrage and capitalizing on inexpensive human capital in developing countries. However, this cost-focused strategy has fared to be unsustainable as the costs of doing business in places such as India and China have raised significantly. This rise in labor cost can be attributable to the easy replacement of these, redundant, tasks by machinery. The BPO industry has tried to increase its efficiency and transition to robotic process automation (RPA) but has proved to be unsuccessful because the underlying system only allows for a piecemeal approach to automation; which fails to address the fundamental systemwide issues.

Additionally, this siloed focus on just reducing costs fails to account for the "vital roles that humans play in handling complex, nonstandard, and changing situations." The business goals of this level is to increase cost efficiency by reducing variable and fixed costs through any means necessary. Additionally, the only stakeholder value focus is to traditional stakeholders in the terms of increased profit (NAE, 2018).

Level 1: Performance-Driven Automation

The next level of automation addresses many of the drawbacks of Level 0 by taking an end-to-end system approach in which the industry stays cognizant of the role that humans play. In Level 1 productivity and other performance metrics, such as accuracy, scalability, speed, and quality of service, drive design and technology decisions. Processes and systems take advantage of the labor displacement that automation has and then incorporates humans to fill in the limitations that technology possess – such as adaptability and critical thinking in various circumstances. An example of this Level 1 automation is seen at Amazon's warehouses. At the warehouses, employees pick, pack, and stow the goods while robots handle the transportation of these loaded bins. In this system the robots handle the routine, straight-forward tasks that require very little dexterity or flexibility. Additionally, these transportation tasks are usually the heavy-lifting portions of the warehousing process and the use of robots reduces risk of injury or need for multiple people to carry heavy bins. This large-scale automation has significantly reduced Amazon's "click-to-ship" cycle times and operating costs (Wingfield, 2017).

The significance in Level 1 of automation is that it moves past simple increasing cost-efficiencies, but it is still primarily driven by business metrics and does not consider holistic workplace implications nor greater societal impacts. This level focuses on the business goals of

increasing productivity, quality of products, and accuracy of production. The stakeholder focus is on the customer and end user through superior product offering and service (NAE, 2018).

Level 2: Human-Centered Automation

Level 2 of automation is the strategy in which businesses explicitly start to emphasize and acknowledge the critical and valuable role that humans play when it comes to technology. The purpose of this level is not to replace human laborers, or push them to the sidelines, but rather to encourage new forms of human-technology relationships and interactions. This emphasis on integration, rather than replacement, fosters a new system of expanding traditional human capabilities and creating new roles for laborers. Toyota embodies this level of automation with its philosophy that "robots are not the strategic centerpiece, but merely enablers and handmaidens, helping assemblers do their jobs better, stimulating employee innovation and when possible facilitating cost gains" (Rothfeder 2017). At Toyota, robots are integrated in the functions that the human laborers define for themselves. For example – the individual employees will produce the goods manually first and then innovate/simplify the process until it is perfect. From there they incorporate the robots, where needed, to aid them in this simplified process which not only retains the power of the employees but also increases production efficiency.

Level 2 leverages human-capabilities to derive business efficiencies through the integration of robots into the traditional functions of human laborers. This ultimately empowers the human workers leading to greater profits and more benefits extracted from the advanced technology. However, this level stops short of consider the broader business-society ecosystem because it is still viewed in the sphere of the individual organization. The business goals of this level is to enhance worker performance, employee skills, and the quality of work. Additionally,

its stakeholder value focus is on the employees to provide safety, autonomy, and opportunities for achievement (NAE, 2018).

Level 3: Socially Responsible Automation

The final level of automation uses the integration of advanced technologies to transform organizations and societies to a new level of profits and efficiencies. This level is defined by two core goals: driving growth through automation while promoting economic performance as well greater societal well-being (NAE, 2018). Automation is inherently labor-reducing; however, the very same shifting structural dynamics could potentially produce a counter-balancing movement towards macroeconomic fulfillment. Productivity gains from automation could lead to increased demand for a company's goods and services – which in turn could increase the demand for labor and development of new human laborer roles. However, this state of fulfillment depends on the successful implementation of technology under the right conditions of labor supply, income levels, and demand for goods (Autor 2015). Ultimately, a state of economic fulfillment depends on the successful incorporation of socially responsible automation. SRA calls upon smart technology choices, business strategies, and innovation approaches to move automation past cost and performance efficiencies and towards profitable and sustainable growth – creating more and better jobs that will drive economic growth and social cohesion. This level of automation has the business goals of creating new revenue streams and good jobs for human laborers. Its stakeholder value is targeted towards the society through employment, prosperity, and equality (NAE, 2018).

History has proven that automation, rather than destroying jobs, can create net new jobs. In the 19th century, new technology enabled more goods to be produced with less effort, i.e. power looms producing cloth. This reduced the prices of these goods substantially, leading to an

increase in demand from consumers. This rise in consumer demand not only drove further productivity improvements, through progressive refinement, but also increased demand for workers with the appropriate new skills. This trend will prove to be the same with applied to the rise of the new industrial revolution. By automating more complex tasks, automation could potentially reduce costs, lower prices, and increase demand – ultimately creating new jobs (Evans-Greenwood, Lewis, Guszcza, 2017).

Fourth Industrial Revolution

The first industrial revolution, around 1760, was marked by the steam engine which enabled new manufacturing processes and ultimately the creation of factories. The second industrial revolution, around 1870, was built on this initial development to introduce and implement mass production within the factories in new industries such as steel, oil, and electricity. The third revolution, in the 1950s, saw the introduction of the integration of technology in our everyday lives through the invention of the personal computer and internet. Finally, the fourth industrial revolution, present day, is different from its predecessors because of the speed of technological changes and the blurred lines among digital, physical, and biological worlds. To summarize: the first industrial revolution was mechanization and steam power, the second was mass production and electricity, the third was computers and automation, and the fourth is intelligent, connected, and adaptive networks. Notable features of the fourth industrial revolution include big data analytics, process automation, robotics, internet of things, artificial intelligence, cloud computing, and many more.

Extraordinary and previously unimaginable technological advancements have enabled the fourth industrial revolution - marked by fundamental changes in the way humans interact with

themselves, others, and technology. The speed and depth of this revolution shows promise for great prosperity or peril, depending on how quickly and efficiently society is able to adapt. This revolution has also forced a re-engineering of the way organizations create value and how humans interact with corporations. However, it is more than just a technology-driven change. This revolution is an unprecedented opportunity for people from all classes, nations, and groups to harness these developments to get closer to a more human-centric future. This is attainable through transparency of automation implementation, corporate intentions, and active conversation. Ultimately, this technology is not the destiny. It is in society's control to look beyond the technology component and instead use this inadvertent revolution to positively impact communities, families, and corporations.

II. Pessimistic View

Key Challenges

The biggest issue surrounding the fourth industrial revolution is the uncertainty. As this phenomenon continues to mature it will have unparalleled disruptive impacts on society – fundamentally changing the way we communicate, organize, and create value for ourselves. Legal and social systems are trying to keep up with the unprecedented and uncomfortable speed of the introduction of new technologies and functions but are not able to keep up. The duality of ethics and values associated with these new technologies makes it impossible to try and ignore the issues, for the sake of progress, and thus must be addressed when discussing automation. For example, emerging technologies, such as artificial intelligence and drones, can help add value to society through increased security, service delivery, monitoring, data collection, etc. However, these same technologies can also infringe on basic human rights and civic freedoms. The four key challenges to the fourth industrial revolution are (1) the consolidation of power asymmetries,

(2) increase in inequality amongst the changing society, (3) advanced technologies failing to embody human-centric values, and (4) a lack of governmental understanding of the changing landscape and consequently a lack of appropriate regulation.

Consolidation Leading to Power Asymmetries

Every industry is expected to experience some level of consolidation as it matures and grows; however, the nature of the automation industry's rate of consolidation has become a cause for concern. The biggest technology firms have been on a rampant "shopping spree for AI companies" which suggests that these behemoths' no longer are focused on the technology itself but rather control of it (TechCrunch). Between the years of 2011 to 2015 mergers and acquisitions activity of AI startups increased by a factor of seven. Additionally, most of these start-up companies were acquired within four years of their first funding round (CBS Insights). This accentuates the fear that these companies do not care for a well-developed product but rather want to get their hands on the technical talent and intellectual property that these start-ups could potentially harness before others do. Additionally, these early-stage acquisitions stunt the progress and growth of the industry as a whole because these start-ups fundamentally change after being acquired. Whether it is intentional or not, the existing product road maps of large companies and standards of the acquirer will impact the smaller company – and potentially hamper the initial novel ideas that the start-up had to offer. Ultimately, these tech giants have a duty in favor of profit margins which also influences its collaborative efforts. Although these companies claim to have open-source codes and access to its development software they are unlikely to disclose critical components that are important to its competitive advantage. This dissuades true collaboration and knowledge transfer for the sake of retaining propriety knowledge and profit maximization.

As big tech companies become the only corporations large enough to handle, or understand, the developing technology industry they will continue to increase their stronghold within the economy and society. The solution to this issue is through active and targeted regulation and changes how our government understands the emerging technology space.

Increase in Inequality Amongst the Changing Society

As seen in historic trends, automation tends to replace low-skilled occupations first. This makes intuitive sense because those are usually the more mechanic and repetitive job functions that are easier to automate. This creates a potential for increased automation to breed greater inequality between the classes because highly skilled workers will be able to demand higher wages and better jobs. The potential productivity gains and economic benefits of automation can be expected to fundamentally reshape different occupations and sectors. Automation will also call for new jobs, which creates a reallocation impact rather than elimination. This also creates new sources of wealth and different way to create value. With these possibilities in mind the bigger focus should be on how to equally distribute the rewards of automation. This is where the importance of correct and deliberate implementation is really shown. If the benefits of automation can be successful distributed to all then the overall economy would flourish. However, if the rise in automation is poorly managed then it may create a paradox of the plenty in which society, as a whole, seems far better off but in reality the rich are doing very well and the poor are suffering (Franklin, 2018).

Lack of Governmental Understanding and Regulation

A government's legitimacy is bound and upheld through its accountability to its constituents; however, the private sector does not share that same strict responsibility. The

private sector has historically taken it upon itself to act in ways that benefit society at large – whether it be through corporate social responsibility measures, charity organizations, etc. However, the independence of the private sector operations loses its credibility when it begins to fundamentally impact the fabric of America. One major area of concern is how technology can disrupt the American democratic system in its ability to serve and protect the current and developing interests of its citizens. As technology continues to progress at an unprecedented rate, it becomes increasingly difficult for policy makers to understand the developing industry and make decisions accordingly. This creates a potentially catastrophic scenario in which the technology leaders start to maneuver legislation, rather than the other way around. One of the most cherished values of the democratic system is the people's ability to influence and control governmental power by electing the people who make laws, regulate, and govern the public. In a similar fashion, technology leaders are chosen by board of directors who are chosen by stakeholders. However, if these technology leaders begin to govern and pave the way for technological regulation then the votes of the public go way-side to make room for the votes of the select shareholders.

To address this issue there is a strong case for the government to try and innovate its regulatory space in the same manner and rate that technology companies are. This could mean changing the system to where governments work with incremental initial regulatory steps instead of waiting for ideas to fully mature and then processing regulation to address the whole concept. Additionally, this could be an ongoing process in which, as the technology develops, the government can take stock of how the incremental regulations are panning out and then adjust, as necessary. This can be compared to how companies use minimal viable products, "the first regulatory step would not be the last" (Smith and Browne, 2019). The ultimate rationale for this

system would be that governments will be able to put laws into place faster – as the governments can learn from their experiences and subsequently use these lessons to add to new regulatory provisions. This integration of cultures must be calibrated to the intensity of governmental influence – so officials must still consider broader inputs, remain thoughtful on what precedents could be set, and ensure that they have the right answers to at least a limited set of important questions.

A natural issue is that of this more active approach of governmental regulation is that it will require officials to develop a deeper and clearer understanding of how technology works and the subsequent trends. This brings up the unprecedented consideration of the relationship between those who create technology and those who regulate it. Many critiques of the rise of the tech sector have noted that the current people in the government do not understand enough about technology to properly regulate it – even those these companies profit greatly from governmental funding and support (Smith and Browne, 2019).

"Operating far away from the centers of political and financial power in a pleasant and sleepy corner of Northern California, they created an entrepreneurial Galapagos, home to new species of companies, distinctive strains of company culture, and tolerance for a certain amount of weirdness." – Margaret O'Mara, Historian at the University of Washington

The harsh reality is that, historically, the government has proved to be inept when regulating a lot of different issues. Technology is complex to understand. But so are commercial airplanes, advanced pharmaceuticals, developing foods, etc. The issue of governmental lack of understanding regarding technology needs to be handled in the same way that other complex issues are addressed. This area of concern can best be addressed by the tech companies taking initiatives to help share information and nuances to the public and the government. The tech

companies need to recognize that their industries are not different from other complex industries and that they are not free from regulation just because regulators do not fully understand the end product. Governments can place this prerogative on the tech companies – creating a cycle of information and, ultimately, appropriate regulation.

In 1961, President John F. Kennedy established the Office of Automation and Manpower to study the challenges and societal changes that were resulting from the increased presence of automation. Similarly, Lyndon B. Johnson inaugurated the National Commission on Technology, Automation, and Economic Progress to evaluate the risks of robots and its impact on human labor. These initiatives were proactive measures taken by the government to ensure that it had a handle and understanding of the changing market. The current government should also look to create a separate committee or initiative that focuses on staying up-to-date on developing technologies and understanding the nuisances of the industry which can then be relayed back to the policy makers – thus ensuring that more effective and informed decisions can be made.

The pessimistic view and challenges raised are extremely important and are valid concerns. However, they are not enough to stunt the societal progression and technological advancements that are already on course. The best steps from this point is to make deliberate and targeted efforts to maneuver this revolution to yield the best results for all. This is attainable through active conversations and increased efforts from the government to make sure that we do not let the technology become our destiny. To illustrate the duality that the automation revolution poses we will look at a company that is always on our minds and our daily lives: Amazon.

Amazon

Amazon.com, Inc. is an online retail shopping services company that provides to four primary customer segments: consumers, sellers, enterprises, and content creators. Its services its customers through a focus on selection, price, and convenience. The website to designed to enable a plethora of products to be sold by third parties and companies to virtually anyone in the world. As of May 8, 2020, its market capitalization is USD $1.187 trillion (Yahoo Finance).

Amazon has been investing in automation technology for many years now. In 2017, the technology behemoth claimed to have over 100,000 robots working in its warehouses around the world. Iconic robots, known as CartonWrap robots, have started to replace human packers internationally (Whittle, 2019). Amazon has considered installing machines that could automate 24 job roles into a singular machine – which would amount to more than 1,300 job cuts across its 55 U.S. fulfillment centers. Over the past 10 years the number of Amazon warehouses has increased 59x and the company has been looking for ways to automate many parts of its business. When asked about the precarious nature of Amazon's initiatives to displace jobs with robots an Amazon spokeswoman said "We are piloting this new technology with the goal of increasing safety, speeding up delivery times, and adding efficiency across our network. We expect the efficiency savings will be re-invested in new services for customers, where new jobs will continue to be created" (Whittle, 2019).

Currently Amazon's focus is on a new machine known as the CartonWrap from the Italian firm CMC Srl. This machine can pack 600 to 700 boxes per hour, which is about four to five times faster than an average human packer. These machines require one person to load the customer orders, another to stock cardboard, and a technician to fix occasional technical errors. Traditionally, this role of refilling packing roles had the highest turnover – as boxing multiple

orders per minute over a typical workday can prove to be arduous work. The CartonWrap will allow Amazon to steer away from placing humans in these refilling packing roles and instead train them to be qualified for more technical roles. Amazon claims that these initiatives are not for speed but rather efficiency and savings. The Company claims that ultimately these initiatives are in an effort to "re-purpose" workers.

These CartonWrap robots may seem like an innocent attempt to displace workers to higher-skilled job functions; however, its impacts have been much more severe and in the opposite direction. The humans that currently work in the Amazon warehouses and fulfillment centers are forced to work alongside these robots and are placed under very strenuous conditions. Workers are pressured to compete against these robots and "make rate" in the same way that the robots do. This creates an expectation of sometimes packing hundreds of boxes per hour and the fear of losing their job if they are unable to perform fast enough. These pressures and fear that is a direct result of the institution of robots are far greater than the general public is aware of. In 2018, a signed letter from an attorney representing Amazon stated that the Company had fired hundreds of employees at a single facility, between August of 2017 and September 2018, due to the failure of meeting productivity quotas (Lecher, 2019). Besides the integration of robots creating unrealistic standards for the employees, Amazon is also using automation to abuse its control over its employees. Amazon uses a deeply stringent automated tracking process that directly leads to an automated termination process. According to a document written by Crystal Cary representing Morgan Lewis, a global law firm, Amazon has an algorithmic system that tracks the productivity rates of each of its employees and generates automatic warnings based on these metrics. After a certain quantity and type of warning this system automatically generates terminations, without any input from supervisors. Although Amazon later responded to this letter

and stated that supervisors have the ability to override this automatic process. An example of an action triggering a warning is a “time off task”. If a worker is to take too long of a break or pause between his or her job function, such as scanning packages, then the system will automatically generate a warning. This system has even led some employees to avoid bathroom breaks for the fear of not making the correct pace to meet expectations (Liao, 2018). The big issue in this system is that the human employees have become numbers rather than people. In the name of efficiency these workers have turned into being regarded as machines rather than living people with standards and rights. Additionally, the dignity of these human employees is questioned when they are working in constant fear of their boss which is a robot (Carey, 2019).

However, this is not the only instance in which Amazon undertook automation initiatives without consideration for human laborers. An Amazon facility in Kent, Washington has incorporated 750-pound robots with “shelve-heads” to roam around the warehouse and bring merchandise to sitting employees who them retrieve items from the robot’s “window.” Figure 2 showcases a cage-like enclosure with a small work chair sitting on top of a robotic trolleys that maneuvered the contraption around the warehouse. This technology was patented by Amazon as the Company believed that this cage for humans was the right approach to integrate machinery and humans.

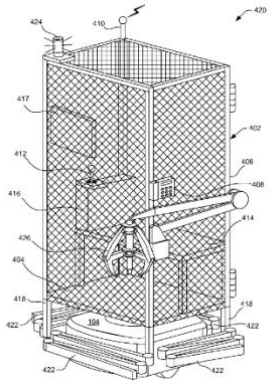

Figure 2: Cage-like enclosure

After the exposure of this patent, Lindsay Campbell, an Amazon spokeswoman, commented that speculation regarding the patent was misguided and that "like many companies, [Amazon] files a number of forward-looking patent applications" (Day, Matt, Romano, 2018). Later, after the story was published online and caught the attention of many media outlets, Dave Clark who is vice president of operations stated that the Company had no plans or intentions to implement the contraption. Regardless of whether the patent is put into place or not, the sheer idea of the contraption sparks conjecture about Amazon's business plans and work conditions. Kate Crawford, co-founder of the AI Now institute at New York University, and Vladlen Joler, a professor at the new media department at the University of Novi Sad and principal researcher at Microsoft Research, conducted an in-depth case study on the various automation tactics that Amazon has started to incorporate into its ecosystem. In their research work titled "Anatomy of an AI system" they describe the patent as "A metal cage intended for the worker, equipped with different cybernetic add-ons, that can be moved through a warehouse by the same motorized system that shifts shelves filled with merchandise." They continue to describe the impact on worker's in that "Here, the worker becomes a part of a machinic ballet, held upright in a cage which dictates and constrains their movement" (Crawford, Jole, 2018).

Amazon is a classic example of a company obsessed with efficiency profits – to the point in which it focuses on trying to eradicate human interaction with its operations and empowerment through control. In the patent there are various scenario descriptions that details the functions and actions that would happen in different circumstances. One of which describes that if a robot has failed then it would alert a computer system, which would then automatically generate a repair order, that then finally gets assigned to the human transport device (Day, Matt, Romano, 2018). Essentially, overriding any human control of regulating the technology.

In September of 2019, Amazon announced that it did have a focus on automation, but that full automation was at least a decade away. This is because in reality the risks of full automation are way too high – automation is the most effective when it is designed with humans in mind (Whittle, 2019). While artificial intelligence is improving the accuracy and abilities of machines there is still the major shortcoming of a machine's ability to adapt to different items. Currently, there is no guarantee that a glass jar will not slip out of the metal tongs of a machine or that a machine can easily switch from picking up a pencil to picking up a table. To compensate for these shortcomings human employees are tasked with placing the individual items on the conveyor belt and then having the machines build boxes around the items and finish out the labeling and sealing. This reduces costs by saving labor time, reducing wasted packing materials, and increasing the number of packages that get done in a working day (Whittle, 2019).

Amazon is a very interesting case in which it has been able to witness the significant benefits of automation but also serves as a clear case of automation being taken to the extremes. The Company is an important example that should be carefully understood, analyzed, and scrutinized by the government and the people. Only by fully understanding the complete picture of how big behemoth technology companies are using automation will we be able to control its implementation. Amazon illustrates how important regulation and deliberate implementation is to maintaining workers' rights, increasing efficiency, and ultimately creating the greater-good environment that we are all striving for.

III. Optimistic View

Reality of Automation Today

Although there are many drawbacks to the increased prevalence of automation, this revolution poses an opportunity for society to transcend itself unlike any industrial revolution before. As organizations and institutions continue to embrace robotics, AI, and automation they are finding out that virtually every job can be redesigned and/or reallocated – which could potentially create a new and better societal structure. Due to the rise in the artificial intelligence, cognitive technologies, and robots to automate and augment work – jobs today are more machine-powered and data driven which requires more human skills in problem solving, communicating, interpreting, and design (Volini, Roy, Hauptmann, 2019). As machines continue to replace repetitive task and mundane work, many jobs will evolve to create a new job category that will change the landscape of organizational operations.

In reality automation's effect on jobs is not as detrimental as skeptics think. A Deloitte study of automation in the U.K. concluded that 800,000 low-skilled jobs were eliminated by AI and other automation technologies; however, from these same AI and other automation technologies 3.5 million new jobs were created and paid on average about $13,000 more per year than the displaced roles (Ghafourifar, 2017). When thinking about these statistics in terms of the developing society of the United States it is clear to see that although some jobs are being displaced, many more are changing. If, and when, automation removes routine work it will strip away the mundane portions of labor and leave the "human" parts – enabling the role and contribution of humans to increase in importance and value. Thus, the true value of automation lies not in the ability to replace human labor with machines but rather in "augmenting the workforce and enabling human work to be reframed in terms of problem-solving and the ability

to create new knowledge" (Volini, Roy, Hauptmann, 2019). From a research study in 2019, 62% of respondents are using automation to eliminate repetitive tasks, 47% of those are also augmenting existing operational practices to improve productivity, and 36% are reinventing job functions. Many respondents also claimed that they were focusing on reskilling; 84% of the respondents who said that automation would lead to internal skills training are reporting that they are increasing funding for this reskilling, with 18% characterizing this training as an investment (Volini, Roy, Hauptmann, Figure 2) .

Moreover, this trend towards robotic process automation (RPA) is a definitive force that will fundamentally transform the traditional societal structure, whether we like it or not. A research report published by Global Market Insights, Inc. reported that RPA market size is expected to exceed $5 billion by 2024. As more and more organizations start to realize the advantages of strategically incorporating automation into their daily operations – the industry will continue to exponentially grow. This inevitable snowball effect is predicted to see a 20% compounded annual growth rate and our actions should be taken according to these predictions (Market Watch, 2018).

Case Study – Creation of New Roles

A poster child for the successful integration of SRA is Marline Steel Wire Products LLC. This small business manufacturing company reinvented itself through a series of deliberate investments in automation that propelled the productivity and capabilities of its workers. In the early 2000's Drew Greenblatt acquired the Company and made significant investments. He purchased $2 million worth of robots in a span of 15 months in response to encroaching competition from China. This investment transformed Marlin, as revenues went from $800,000

pre-acquisition to over $5 million in 2012. The Company fully internalized automation and integrated human-labor to create new skillsets and competencies for its traditional workers. The essence of Marlin's reemergence was a strategic focus on creating highly customizable products and delivering them at expedited speeds. This was achievable through a significant investment in cross training – about five percent of the Company's direct labor budget is spent on training every year. This "makes [the Company] more adaptable and more nimble and helps [the Company] to weather turbulence in the economy. And it ensures that one person with all the skills is not a bottleneck" (Broughton, 2016).

"But our company, like all companies, is dynamic. Today we have totally different challenges and needs for technical skills than we did five years ago... We are going to beat the competition because of the technology. These are factory workers turning into coders to exploit the technologies." – Drew Greenblatt, CEO of Manufacturing

Cross training the employees in this manner has allowed the Company to expand its product lines, sharpen its competitive advantage, and beat out a lot of competition. The high variability in client orders makes it essential not to be too reliant on one person doing one function. For example, if the wire basket cell is slow employees do not just sit idly. Instead they go to the laser cell and help add to that profit segment. In this system employees are transcended from blue-collar workers to career employees.

"We don't silo employees – by cross-training them, they become more valuable. By having a nimble, agile workforce, we can meet client demands because employees can move around from machine to machine. It's actually cheaper to run the business this way. We are able to do more with less – we have higher paid employees and we don't need temps." – Drew Greenblatt, CEO of Manufacturing

Drew Greenblatt and the executive team incentivize this cross-training through a pay-for-skills program, known as the Skills Matrix. The Skills Matrix identifies each employee's unique proficiencies, the skills that he/she needs to learn, and the skills that the Company values the most. This chart is displayed prominently and so when an employee learns a new skill not only does, he/she get a permanent wage increase but public recognition as well.

"To create the Skills Matrix, we looked very closely at the specialized skills employees needed to master for the company to be successful. For example, the laser has to be set up, programmed, and maintained. The company will thrive if the laser is performing many hours a week and there is a trained team who will not let it sit dormant, or wait, or break down. There are other machines too, such as the punch and the wire forming equipment, and we need people running all of those proficiently and consistently. Sweeping with a broom doesn't require skill, so that is not on the matrix." – Drew Greenblatt, President and Owner

Mr. Greenblatt also recognizes that the Company is continually evolving and subsequently so will the skills on the Skill Matrix. For example, in 2010 the Company bought its first lasers and then shortly after in 2014 bought a medium frequency welder, one of only five in the world at the time. This proves the necessity of keeping the conversation of skills and training flexible to evolving standards. This clear and dynamic system has also proven to empower employees – as it makes it very clear what the Company expects and how individuals can get ahead. The amount of permanent wage increase is proportional to the difficulty of the skill, more money for harder to learn tasks.

Mr. Greenblatt has implemented two objective systems that have fostered a strong, positive workplace culture. The first is the Skills Matrix, explained previously, and the second is a bonus structure based on target performance. Each individual is given full responsibility of

his/her individual domain and if he/she performs well then, he/she is rewarded appropriately. For example, the laser department at Marline Steel is comprised of two people. Within this domain both employees have access to all the materials needed to hit the targets that the Company assigns. If they are able to hit the, attainable, targets then they are rewarded with a bonus because the Company profits from this achievement as well.

"People are not a variable cost – they are a fixed cost like a mortgage or a bank payment. If you train your people and invest in them, they will cover your back and make sure junk doesn't ship and the machine doesn't wheeze. When you work this way, you get more orders, clients are happy, and employees stay longer. It's a win-win-win!" – Drew Greenblatt, President and Owner

Human and Automation Symbiosis

With the proper public education on automation and transparency from the corporations, the technological advancements can be used to help human laborers. Human-centered automation is the use of advanced technologies to help enhance the capabilities of human laborers to increase user effectiveness and reduce error. This automation that aids the work of human beings does not necessarily have to be human focused. Similar to the automatic transmission in a car, these advanced technologies can operate independently and in the background. There is a very fragile relationship between humans and machine agents – both of which can mutually benefit from the other's shortcomings and strengths. Machines are knowledge-based systems that can be expected to work in a consistent and timely manner. These machines are also programmed to do certain tasks which reduces the chance of error, distraction, or fatigue. However, these machines are very rigid in their programming and so cannot be expected to adapt to various events or cope with unpredicted circumstances. This is where

human intelligence proves to be pivotal. These human agents can detect and address these shortcomings and act accordingly (Christine, Springer).

The idea of incorporating robots into the daily functions of human laborers is not a novel concept. In 1961, General Motors introduced an industrial robot named Unimate. Unimate, a 4,000-pound arm, could weld and die-cast car components alongside its human counterparts. 50 years ago, General Motors introduced a concept that we still use today and what might just help create a better future. Human-centered automation allows for machines and humans to coexist by eliminating the previous mundane tasks that humans had to perform. This idea of coexistence allows humans to maintain a central role while automation does the tedious jobs. An important distinction to make amongst all the speculation and uncertainty around the future of automation and what it means for our economy is that it is still ultimately in our control. The technology advancement is not our destiny. Rather destiny is still ours to shape which, through deliberate action and transparent conversations, could benefit society in ways never before imagined. This reinvention of the application of automation is what makes this transformation vastly different from its predecessors.

Georgia Tech's Center for Human-Machine Systems Research

Matthew Gombolay, a professor in the School of Interactive Computing at the Institute for Robotics and Intelligent Machines (IRIIM), leads the CORE Robotics lab at Georgia Tech. Ayear old, this lab develops and researches advanced algorithmic techniques to enable robots to work with humans. Researchers at this Atlanta-based university have a vision for the future of human-robot interaction that could transform the previously stagnant relationship. Rather than using robots as tools, these researchers envision a dynamic relationship, between humans and robots, in which robots can learn through interactions and experiences to offer a greater value

add to its human teammates. The methodology that the CORE uses incorporates a three-pronged model. The first prong is to specify the allocation of control functions between the human and robot counterpart. The second component is to design and control intelligent displays in real time. Finally, the third prong defines and implements the learnt intelligence for operative assistance and intelligence tutoring. The ultimate theme of the lab's research is establishing a relationship of coexistence rather than interaction in which these collaborative robots become teammates with human laborers.

Gombolay's students focus their attention on both researching robots and humans. The study of human behavior aids in their understanding of human decision making and what adaptive minds go through before deciding to act. Georgia Tech believes that by better understanding humans, researchers will be able to better control robotic behavior and enable more effective collaboration. The methodology for this research of human behavior focuses on third-party observations. Basically, an observer being able to understand what workers are doing without them having tell you. Gombolay and her students would visit factories and observe what the workers were doing and infer the employees' strategies by their respective actions. A unique methodology that Gombolay employs is a counter factual-reasoning approach to observe not only what the workers do but also what they do *not* do. These observations help in streamlining predictions for what actions experts are likely to take. Ultimately, helping create a clear decision-making model to transform into an algorithm for robots. Additionally, Gombolay and his student focus on a real-world application of the cobots by working backwards from an end goal.

"Julie really pushed doing research in real-world settings. What I found special about my time as a Ph.D. student was working directly with the people in the factories or healthcare providers

in a hospital setting, to make sure whatever problem you're trying to solve will have operational relevance. That's a culture I've brought with me to Georgia Tech." – Dr. Gombolay

Gombolay's research builds on the notion that the crux of human and robot collaboration is developing both parties to be independently superior in certain capabilities, but infinitely better together. A major industry of applicability, at Georgia Tech, is the healthcare industry. Gombolay is working to explore robotic apprenticeships that could help in understanding and predicting the needs of nurses which could help to expedite training, combat operator burnout, and reduce error. This industry is of particular importance because of the clear incremental benefits of AI and this applicability makes the old argument of "robots stealing jobs" particularly inapplicable.

"Their job is insanely difficult. Robots aren't even close to 5 percent of what a nurse or doctor does in interacting and caring for patients or facilitating teamwork. With machine learning, we're getting close to maybe automating 90 percent of 1 percent of some of these decision-making tasks in very narrow settings." – Dr. Gombolay

Case Studies – Enhancing Traditional Roles

Ergonomic Assistants:

At Moodng, a South Korea-based Tier 1 automotive supplier, a Dooson cobot (collaborative robot) works among a team to help in the assembly lines. This robotic helper eases the ergonomic challenges associated with gluing interior carpet liners to make the process faster, easier, and safer for the human workers. A manager at Moodng stated that "after instating the cobots, [the] productivity [of the factory] improved by 25 percent" (Anandan, 2019). The Doosan cobot is calibrated to spray a specified amount of glue at a certain speed consistently

throughout the day. This improved the quality and efficiency of the overall process because previously workers would suffer wrist pain and other repetitive injuries from trying to apply glue to wide areas of carpet material while also keeping a firm hold on the glue dispenser's injection button. The manager also commented on how easy it was to program and monitor the cobots. The Dooson cobot has a touchscreen teach pendant and buttons on the robotic arms that makes it easy to program its functions and adjust the physical arms to a desirable position. With pre-programed templates for common tasks and physically moveable arms, these robots are easy for operators to control without having to write or know complicated programming scripts. Moodng operators also claimed that the approachable and less intimidating aesthetics of cobots makes them feel safer working next to these machines. These cobots are also being applied in other industries in Korea, such as the restaurant business. The collaborative duo of robot and man can be found in the kitchen as well – with the human holding the creative knowledge and the robot replacing the human's position of danger around hot oil splatters and other hazards.

Precision Assistance:

The most obvious application of precision assistance automation is in the healthcare field. In this regard, robots can help reduce error and increase precision with which nurses are able to deliver care, surgeons are able to operate, and doctors are able to diagnose issues. A mult-imodel robotic scrub nurse (Gestonurse) used in operating rooms is a real-world current application of precision assistance automation. Gestonurse assists the main surgeon by anticipating the tools that the surgeon will need, based on the type of procedure, and then pass the necessary surgical instruments to the surgeon. The robot can also pass the instrument that the surgeon specifically requests. This reduces the potential of miscommunication, human error of

picking up the wrong tool, and can also help address the issue of understaffing in the medical field.

Gestonurse is based on the idea of surgeons being able to request certain instruments simply through hand gestures and/or speech. This robot is the first time that non-verbal cues have been considered as a modality of interaction between robots and medical professionals. This is impactful in the long term because it reduces the need for total re-training of surgeons because this system of communication is what the professionals are used to. To test this idea experiments involving human-robot collaboration were conducted on a patient simulator. The simulation was assessed during a common surgical task – an abdominal incision and closure. This was a common procedure but one that requires extreme precision and timely incisions to avoid unwanted ruptures or punctures of surrounding organs. There were two trials in this experimentation: one with a team of a surgeon (Figure 3) and a robot nurse and another team with the same surgeon and a human nurse. The surgery, situation, environment, etc. were all the same across both experiments. The results that were tested and compared were: the economy of movements, learning times, and recognition accuracy. The ultimate results showcased that the robot assistance improved the overall surgical procedure by reducing the number of movements and reducing the surgery time (Wachs, 2012).

Figure 3: A surgical simulator

Autonomous Adaptability:

Whirlpool management at the Łódź, Poland plant faces a unique challenge of figuring out how to optimize the internal transportation of components between the production lines with loading and unloading automation. To address this complex production problem, Whirlpool has deployed three mobile industrial robots (MiR) to transport components between different stages of the manufacturing process.

"At our factory, a dryer leaves the production line every 15 seconds. This requires transporting a huge number of components. Mobile robots provide us with a completely new way of delivering parts without human involvement. This enables employees to focus on higher value-added areas. Collaborative mobile robots also significantly improve safety, allowing us to avoid all potential collisions between people and devices such as forklifts or tuggers" –Szymon Krupiński, Site Leader at Whirlpool company in Łódź.

These robots are particularly impressive for their adaptive abilities. "The robot drives to the preassembly line, moves under a cart loaded with boxes, and spreads the "wings" of its top module to engage with flanges on the underside of the cart, creating a secure link. The cart is then transported to the assembly line and the boxes are unloaded. At the same time, empty boxes are collected on the cart's upper flow rack. Loaded and empty boxes flow between the cart and the assembly line via gravity. Afterwards the robot returns to its starting point and repeats the transportation cycle. A full cycle takes just under 4 minutes" (Anandan, 2019). Along its route, from preassembly to assembly lines, the MiR's sensors and scanners allow the robot to detect obstacles such as operators, other infrastructure, forklifts, etc. These robots use advanced navigation technology and simple algorithms to quickly adapt to changes in production area layouts in addition to obstacles. Additionally, the simple programming of the MiRs allow for

users to easily specify or change the routes to adapt to changing layouts and avoid areas frequented by people which helps to minimize the risk of collisions.

"The ease of operation of MiR robots allows them to be used by staff without any engineering or programming background. This enables us to effectively utilize the robots without making big investments in training the employees in the context of the new technology" – Paolo Aliverti, Logistic Program Manager Industry 4.0, Whirlpool

The return on investment period for these MiR robots is less than two years. Before the robots were introduced, these functions of complex transportation were performed by vehicles operated by trained employees – forklifts and tuggers. The replacement ratio is three MiR robots to one operator-driven vehicle. Through this implementation of robots, operators can be used to focus on other organizational tasks (Anandan, 2019).

"By changing the system from human-operated to automated delivery we can boost productivity and engage employees to final product manufacturing. We are satisfied with the application implemented both in Łódź and in Radomsko. The MiR robots provide us with low cost of automation and flexibility in changing the plant layout. We consider the two-year return on investment as attractive" –Adam Bakowicz, Process Technology Senior Engineer Industry 4.0, Whirlpool.

Customer Relationship Management (CRM) and Cloud Companies:

Sales Force Automation (SFA) are software applications that have been designed to streamline sales management. The applications are part of a larger system that automatically records all the stages in the sales process. The overarching idea is to track all customer contact, including timing, purpose, frequency, etc., to aid in the follow-up process which ultimately aids

in managing business leads, sales forecasts, and team performances. There are three main applications that make-up the holistic SFA process. The first is Contact Management; this software allows companies to track communication with all customers and automatically creates a complete history of all interactions, sales, and ongoing activities associated with all clients. The second is Task Management. This software is integral for contact management and lets companies create tasks, or reminders, to follow up with sales leads or client processes. This separate application automatically integrates tasks into a team's calendar and, once the task is finished, automatically adds the completion to the account record – creating a complete history of all interactions and completed tasks. The final application is Pipeline Management which provides sales lead tracking from the initial inquiry to the closed date. This application tracks all opportunities and sales which also allows it to apply probability weighting and algorithmic forecasting on the existing opportunities and potential new ones. Finally, SFA is designed to be customized to reflect the individual and unique processes of different organizations. The applications can be tailored to track pharmaceutical sales or to track gas meter readings (Armour, 2018).

This Salesforce Platform is an epitome of the fourth industrial revolution in that "intelligent, connected and adaptive networks allow companies to derive unseen insights from data, automation repetitive manual tasks, and collaborate closely with producers, customers, and service providers" (Opportune, 2019). Sales Force is a leading example of companies integrating manual tasks with robotic automation to make processes more efficient and streamlined. From the reduction of error and time spent on menial tasks, such as tracking customer interactions, teams can focus on the more personable aspects of their jobs – such as client lunches, tailoring plans towards individual investor risk tolerances, etc.

Sales Force is not the only cloud computing company that has picked up on the customer relationship management revolution trend nor is the revolution ending any time soon. As cloud companies start to understand the importance of automation there has been a radical increase in acquisitions by major players in the CRM space – expanding the traditional functions of the platforms that these companies have mastered. In 2012, Oracle bought Eloqua for $810 million (Agam, 2012). Eloqua created "Adfocus" which "enables marketers to create, manage, and measure personalized display ads for key prospects based on their persona and activity" (Reid, 2020). This acquisition allowed for Oracle to stay competitive in terms of making its platform a one-stop-shop for companies wanting to integrate sales, service, and marketing (Agam, 2012). Additionally, in 2014 IBM acquired a leading behavioral marketing company Silverpop. During that same year, at Silverpop's 12th Annual North American Customer Conference, the Company announced an increase from 30% to 40% "sophisticated feature adoption" such as scoring, web tracking, and automated programs. Additionally, the Company reported delivering 50 billion emails in 2013 and processing an average of 5.5 billion customer behaviors monthly. (Reid, 2020)

"As reputation management and data governance become as important a currency as revenue, [organizations] that build a coherent strategic marketing technology framework will be the winners." – Jennifer Reid, Clevertouch Intelligent Engagement

IV. Societal Control

Alteration of Traditional Human-Value System

After every new era, societal roles and human functions have shifted to reflect the advancements. In the 1750's, over one third of the people in England had agricultural jobs; however, in 2012 less than 1% of society was occupied in agriculture. Despite this drastic change in labor force, we are currently breaking records in terms of agricultural yields. The physical labor force became more efficient and as a result a majority of our workforce was able to transition to more mentally intensive work, such as high finance and science. With the unstoppable rise of automation perhaps the fundamental structure of society and derivation of human value will shift like never before. It is possible that the traditional expectations from society and obsession with maintaining an external income will alter according to the increasing prevalence of automation. As automation increases efficiency and reduces unnecessary components of business operations it is possible that the traditional dependence of human dignity on careers will dramatically shift. It could be that unemployment is no longer the escape from the burden of labor but rather becomes freedom in and of itself.

Keynesian Theory

In 1930, economist John Maynard Keynes wrote an essay titled "Economic Possibilities for Our Grandchildren." His argument was that over a period of about 100 years machines and technology would transform our world to where people would work 15-hour work weeks. Keynes predicted that as productivity improved, and laborers were able to get more done in a shorter period of time, people would choose to work less. In this alternate reality man would replace the struggle for subsistence with a"… permanent problem – how to use his freedom from

pressing economic cares, how to occupy the leisure, which science and compound interest will have won for him, to live wisely and agreeably and well" (Keynes, 328). However, this reality is yet to come to fruition – due to multiple factors that Keynes failed to factor into his prediction.

The pre-requisite to America's freedom from its own societal burdens was the satisfaction of basic needs. Throughout history the biggest problem has been the struggle to fulfill basic needs – which Keynes called the "economic problem." He believed that the integration and development of technology would ease the burden of basic necessities and that, after these standards were met, society would evolve to focus on alternate activities. However, he failed to account for the possible shift in what was deemed as a basic necessity. The most basic example to exhibit this transition is with the amenities of running water, electricity, phone service, etc. During the times of his writing these amenities were considered luxuries. Now these same utilities are considered absolute basic necessities with the addition of other unpredictable amenities such as internet access and healthcare. Of course, it is clear that these advancements have been incredibly important in the heightened standard of living and can be used to showcase the success of the human race's development. But what if this heightened standard of living prevented society from reaching Keynesian's utopia? As this minimal standard for achieving basic utility increases so do the requirements for individual economic progress. With the increased baseline comes increased life expectancy and thus increased wealth requirements to sustain the baseline utilities over an extended period of time. Ultimately, Keynesian believed that if the peoples' absolute needs were satiated then the "economic problem" would be resolved. However, if the very definition and standard of an absolute need is ever growing, in accordance with the developing society, then that satiation is near impossible.

Another factor Keynes did not factor into his prediction regarding basic human necessity was the human psyche and the its inherent desire to compete. As basic labor and functions in society started to get replaced by alternate methodology, humans continued to progress and find new functions to increase output. As income and availability started to increase so did the baseline for satisfaction. This inadvertently created a desire to keep advancing, keep earning, and never reach a satisfaction point. This also made it harder to break free from the cycle. For example, if you make $500 dollars per hour. It becomes harder to take an hour off and go relax. The opportunity cost of that hour becomes $500 instead of a mere $50 or $100. This vicious cycle has led to unprecedent success and development; however, it has also prevented society from reaching a level of satisfaction. Thus, this inherent insatiability cracks Keynes prediction of an eventual resolution to the economic problem.

Ultimately, Keynes envisioned a world in which society abandoned its previous ideology that the purpose of life was economical and instead become interested in other noneconomic pursuits. He believed that, yes, economic pursuits were important but only as a means to eventually get to a point of satisfaction in which humans can focus on leisure or creative pursuits. He did not believe that economic activities were intrinsically worthwhile and thus should be treated as a means to an end and not as an end itself. Which ties back to Keynes original description of the "economic problem" and how the real problem that man faces is not of satisfying absolute needs but rather occupying leisure. While this may seem to make sense on a conceptual level, the lack of detailed distinctions between economic and non-economic activities creates uncertainties. In today's society we know that job functions can sometimes be a means of leisure and satisfaction in and of itself – aside from the monetary benefits.

The greatest flaw in Keynes's argument is that he believed that once the absolute needs were met, people who no longer strive for relative goods. Relative goods, as he defined as those that "satisfy the desire for superiority" (Keynes, page 326), would only exist as long as absolute needs were still being fought for. Once the economic problem was solved then the functions and presence of relative needs would disappear. This would be the direct result of people not seeing wealth as a proxy for success or superiority. However, we know today, this did not and will not happen. Keynes failed to incorporate or consider what has now become an integral part of the American fabric – consumerism. In 1974 Richard Easterlin, a professor at the University of Pennsylvania, conducted an extensive study to understand the paradox of happiness and its relation to income. His study supported the idea that "each individual, in evaluating his happiness, compares his actual experience with a norm derived from his personal social experience" (Easterlin, page 117). This suggested that the driving factor of the standards of utility are not derived from absolute consumption expenditure but rather relative income. This expanded the application of relative income – in that it not only drives happiness but decisions about expenditure as well.

The analysis of Keynes's prediction of relative needs exposes an unfortunate, but very true, fact of how society and our economy has developed. It is important to evaluate this development to better understand the present and better shape the future. Economic activity and individual competition have developed together to a point in which they now co-dependent. One reason for why this reliance was created is because of society's obsession over wealth and the ideology that wealth is a signal of status and superiority. Wealth has become a barometer of human worth and value to society at-large, this creates its own cycle of wanting to work harder and longer to increase this perceived value. Another reason for why this dependency has woven

itself into the fabric of society is because there is simply no other alternative. The noneconomic activities are noncompetitive in nature; however, they are also noncontributory towards advancing the world. Thus, if humans have an innate desire to continually be progressing and working against some external pressure, such as your rival doing better than you, then partaking in economic activities is the only one for humans to be able to compete. If it is true that humans have a need to compete then the alternative to economic activities must enable humans to continue to be challenged as well. Of course, there are sports and competitive hobbies, but that transition requires a long-time horizon and a gradual process. This also negates Keynes's idealistic world that humans would be able to purge themselves of pining for relative needs. If competition is in humans' blood – then the goal is not to get rid of relative needs but change how humans fill this need.

Consumerism is the driving force of America's thriving economy and also what makes America different from other countries. The idea of consuming material things is long past the sole reason of fulfilling basic, or relative, needs. The act of consuming has become a necessity in and of itself. This is best seen through the novel trend of shops and companies focusing on a customer experience. In today's world the consumer experience is just as important, if not more important, than the actual products that the company is selling. This exploitation of consumerism, by companies, has created an even greater presence of consumers *needing* new things. Firms now dedicate significant portions of funding and effort towards marketing ploys and advertising campaigns that compel consumers to "call right away for a once in a lifetime deal" or to "get it fast before they run out." This manipulation blurs the consumer's experiential needs with its relative and absolute needs. Thus, as the economy grows so does the basic desires and expectations of humans – which then fosters more growth and more needs. Easterlin

summarized this vicious cyclic cycle by explaining "Economic growth does not raise a society to some ultimate state of plenty. Rather, the growth process itself engenders ever-growing wants that lead it ever onward" (Easterlin, page 121). Keynes also underestimated how these absolute needs would be replaced and by what. Stanley Lebergott, author of Pursuing Happiness: American Consumers in the Twentieth Century, tied the emergence of consumerism to the initial outsourcing of basic home productions. His theory surmises that traditionally housewives used to produce almost everything within their home, leaving only the absolute essentials to being outsourced. However, slowly as goods became increasingly useful and accessible housewives began to buy goods that were previously produced. Consequently, this outsourcing freed up the time that housewives had which ultimately led them to go out and participate in the economy. This brought in more income to add to the overall familial income – thereby increasing purchasing power even more. This continued and as household income rose so did the capacity for housewives to increasingly outsource basic home necessities. This implies that the abundance of consumer products reflects the true malleably of human needs and the large impact that economic progress has made on making tasks simpler, faster, and easier.

Potential Policy Responses to Automation

After the emergence and unstoppable presence of automation has been confirmed it becomes crucial to think about the next steps. History has showcased that automation will replace low-skilled jobs and quickly displace all workers that depend on routine tasks for income. With the continual advancement and efficiency of automation, high-skilled labor is starting to feel threatened as well. This drastic shift in societal normalcy cannot be left to natural market forces. This will inevitably create a mass divide amongst confusion and create profound income inequality. To combat this issue, it is imperative that the government actively intervene

to make automation as socially sustainable as possible. There needs to be some system in which the American citizens receive income paid by the government based on overall economic growth. There are two ways in which the government could go about this distribution – universal basic income or inclusive stakeholding. Both concepts have their advantages and disadvantages.

Universal Basic Income

The basics:

Universal Basic Income (UBI) is a distribution system in which each citizen, regardless of income or work status, is granted a fixed amount of income that is sufficient for subsistence. This distribution would be spread out over a scheduled interval. There are multiple different versions of UBI that vary in scheduled interval – from every week to every month to a lump sum of money given at age eighteen. The actual amount that is allotted to each individual would be generally based on how much people need to survive – which on average is around $10,000 annually. There is also room for adjustments and variation due to geographical cost of living and extenuating circumstances, such as disabilities or medical conditions. A major uncertainty surrounding this governmental intervention plan is how the government would be able to fund this initiative and how much it would cost them. For a country like the United States it would cost about $3.2 trillion to distribute $10,000 in UBI to all citizens (Futurism, 2016). After substantial societal changes have been made it will also become, hypothetically, easier for the government to collect these funds. This could be in the form of carbon taxes, resource-based revenue streams, negative interest rates, etc.

Advantages:

UBI focuses on creating income security and allow all constituents to feel all on the same level. The biggest change that UBI will have is on the climate of innovation. Through a standardized distribution of basic income, the government incentives individuals to disassociate their self-worth from their jobs – especially low wage jobs. If there is guaranteed income, then workers will feel less pressure to accept the terms and conditions of behemoth companies. This reduces the power that the big companies have over the civilians feeling trapped in their jobs due to increasing pressures to pay bills. This system would also help the impoverished class the most. All households that are currently living below the poverty line would be automatically granted basic income security. This ties well with the massive presence of automation because traditionally a major proponent of UBI was that it would allow people to engage in non-economic activities. Because UBI would relieve the impoverished class from the fear and burden of having to commit to being a small cog in a large corporate machine, people would be able to focus on creative outlets, entrepreneurship endeavors, new research, intelligent alternatives to traditional operations, etc. Once these advancements are made then everyone will be able to benefit from it equally.

Disadvantages:

A major concern with UBI is related to its advantage – the shift in incentives of work. If automation truly replaces human labor at a 1:1 ratio then the overall GDP and/or national income should stay relatively the same. However, the emphasis on everyone being granted the same resources to live will inherently breed free riders. The unconditional benefits that civilians can expect could disincentivize productivity, work, and challenging one another. The ideal case of displacing traditional labor would be for people to use the time to get a better education, care for

a relative, or research new vaccines, etc. This hand-out amount would also be the same to billionaires and to those living in poverty. The inequality of who deserves it most, on paper, could breed internal tension and distrust for the system that was intended to close the income disparity gap. Finally, the biggest drawback of UBI is the sheer cost of implementation. As mentioned previously, the cost of implementing UBI in the United States is estimated to be about $3.9 trillion per year. This system would ease the necessity for privatized health care and social security institutions; however, the budget is an exorbitant amount for the government to handle.

Case Study:

Many different countries have tried to adopt small introductions of UBI in a certain area or through controlled experiments. In 1974, Canada was the first country to test out the UBI system in a specific community, Dauphin, that was classified as a low-income town. This study resulted in positive outcomes, such as improved overall health outcomes and de-stigmatization of welfare; however, many design faults and lack of funding negated this case study. Additionally, this study began in 1974 and lasted for just four years. To understand how UBI would potentially impact the American system, an Iranian case study will be used. The presence of UBI in Iran is more applicable to understanding the potential impact of UBI in America because the development of the governmental system is somewhat synonymous and the time-period in which Iran has adopted this strategy is more long term – thus has more conclusive results.

Starting in December of 2010, the Iranian government instituted various reforms to the country's subsidy program and became the first country to provide UBI to all its citizens. The government usually provided state assistance through energy and food subsidies; however, over time this system has been diminishing due to inefficiency, waste, and inequality. Due to Iran already having extensive subsidy programs in place, the government only needed to redistribute

the current subsidies rather than create new revenue streams. Prior to 2010, the Iranian government spent about USD $100 billion per year, about 30% of its GDP, on subsidies. After the reform policies the price subsidizes were cut in half to help fund the UBI initiative and garner support for the changes. As expected, this action caused a major price increase through Iran – products such as bread and electricity saw price surges of about two to nine times (Roy, 2016). Also unsurprising was the large fluctuations in inflation that Iran experienced. Throughout these understandable macroeconomic changes, the government made cash transfers, of about USD $45, to about 80% of the Iranian population. However, over time the falling commodity prices made it increasingly difficult for the government to continue providing UBI to all citizens. In 2014, the economic turmoil and prolonged devaluation of the Iranian currency devalued the UBI handouts and was officially reduced by the Central Bank of Iran to a value of USD $17. Then in 2016 due to the continuing unfortunate and unpredictable circumstances, parliament cut payments to serve only 24 million Iranian citizens. (Roy, 2016).

Although this did not pan out perfectly over a long period of time, Iran is still committed to the UBI system. The initial results, prior to the system cuts, made substantial positive impacts on the poverty rate and inequality. All without impacting labor supply which was a significant fear that the government had in when first implementing the system. The UBI implementation caused the percentage of Iranian citizens living below the poverty line to fall from 10.2% in 2009 to 5.1% in 2012. A Gini coefficient test was used to measure the success of the impact on inequality. It was found that the from 2010 to 2014 the Gini coefficient dropped from .4191 to .3367 (Salehi-Isfahani, 2017). The biggest takeaway from this case study is the observations regarding labor supply. Many challengers to this UBI system implementation believed that the cash transfers would make the poor people lazy – as incentives to work hard and ends meet

would disappear. However, this study found no empirical evidence to link subsidy reforms to a change in Iranian labor supply.

Despite all the initial encouraging results, the inflation that arose due to the UBI implementation has caused serious issues for the Iranian government which have persisted even to present day. Although this detrimental spiral of inflation began by the 2010 subsidy reforms, it was exacerbated by the soon thereafter U.S. imposed international sanctions. Additionally, in 2012 the government funded a low-income housing project which was financed by printing the extra currency that was needed for the construction project – violating a very basic principle of economic management. All these factors contributed to the eventual degradation of the system (Salehi-Isfahani, 2017).

Although all aspects of the program were not perfect this case study serves as a good example for the rest of the world to learn what works and what does not. There are some distinctions that should be made that separate the Iran example from the rest of the world. First, Iran has an extremely different ideological attachment to the idea of money being a birthright and the human right to a basic income. A second distinction is that Iran already had significant government revenues being used as state expenditures. Thus, the mode and logic of financing the UBI initiatives were clearer in this economic environment; however, it would not be as clear in a highly liberalized or free-trade oriented economic environment. In conclusion, Iran has served as a good example of the potential benefits that UBI has to offer. As an ideology UBI could greatly improve the lives of many; however, can quickly be tarnished by geopolitical factors, poor fiscal management, and overall macroeconomic changes (Roy, 2016).

Andrew Yang and the "Next Stage of Capitalism":

Through an online forum Andrew Yang, U.S. presidential candidate 2020 (D) and entrepreneur, gave his thoughts on how automation and AI will change the workforce and his opinions on what Americans can do to prepare for this change. As a known proponent of UBI or the "Freedom Dividend", Yang offers a unique perspective on what fundamental shifts need to happen in societal expectations regarding the value of occupations.

The Fed categorized the American workforce to consist of about 40% of repetitive manual or repetitive cognitive jobs, thus subject to being replaced by automation. Non-repetitive manual work (such as house cleaners) and non-repetitive cognitive workers (like designers and coders) are less likely to face threats from AI. Based on these metrics Yang claims that our economic system needs to quickly evolve to be able to handle these imminent drastic shifts. Currently, the health of our country is measured by the stock market, GDP, and unemployment figures. However, these figures fail to portray the subsequent rise in overall stress levels, reduced life expectancies, and rise in drug addictions. Yang claims that the best way to fix the system is to adapt the measurements to include metrics such as environmental quality, childhood success rates, mental health, etc. "If we measure these instead of GDP, we'll focus our efforts on improving our lives, not the stock portfolio of the small portion of Americans who own stocks" (Yang, 2019).

Additionally, he claims that the AI is going to fundamentally shift the traditional value that has been placed on tangible jobs – thus we need to fundamentally change how we view and value different occupations. The example he provides is of a mother who stays at home to take care of her disabled kids. As per GDP contribution, the value of her time spent is $0. However, this is far from the truth. He claims that we need to recognize uncompensated work and

appropriately allocate resources to those who need it – even outside the traditional scope of only giving monetary benefits to those that contribute to the monetary funds.

Paying for Data

When discussing the growing concern of automation-related job loss, UBI is usually brought up. In this application UBI is similar to a more advanced welfare system in which its primary goal is to benefit citizens and allow them access to circumstances that they otherwise would not have access to. However, this form of handouts is outdated in today's society and will not be able to withstand the monumental societal shifts that will come from increased automation. Steve Fuller, author of Humanity 2.0, met with Zoltán Pogátsa who is a Hungarian political economist. They discussed the pros and cons of UBI and how well this "answer" is positioned to solve an encroaching problem. Fuller articulated that at a time UBI was the correct answer to elevating U.S. citizens to take control of their lives and not be dictated by income. However, now UBI is not the best solution for modern and future difficulties.

"It's an old socialist welfare state idea. We do not live in an old socialist welfare state world anymore" – Steve Fuller

To address the growing presence of technology Fuller argues that we need a permanent solution that capitalizes on the issue that we know. He suggests that as automation continues to become increasingly prevalent so will the dependence of data and need for companies to extract data from customers. Fuller believes that one solution could be to force companies to start paying for the data and information that they extract from users – which they are currently not being charged for.

"We could hold Google and Facebook and all those big multinationals accountable; we could make sure that people, like those who are currently 'voluntarily' contributing their data to pump up companies' profits, are given something that is adequate to support their livelihoods in exchange." – Steve Fuller

This alternative solution eases the burden on the government of having to try and find ways to fund the distributions. Instead the people would essentially be financially compensated for the data they are already giving to the companies – and the data that the companies are deriving profit from. He addresses the obvious challenges with this idea, such as the increased need for strict regulation, but also provides solutions for the basic uncertainties. One uncertainty is how the companies would be charged. Fuller clearly articulates his vision for how the companies would be charged and the path of how the money would travel from the company to the government and then back to the people. His vision is that the companies would be charged a flat fee by the government based on three main factors: (1) the number of users/visitors, (2) the kinds and amount of data that is collected by the companies, and (3) what kind of information is being used for profits (Futurism). The money that is collected from these factors would then be placed in a public trust which would then be used to subsidize areas of society such as education systems and national infrastructure. This money would, thus, not be a form of handouts but rather used to indirectly decrease the costs that the constituents have to incur. This would ease the monetary burden of the people and stabilize the economy as AI and automation become increasingly prevalent (Gohd, Chelsea, Creighton, 2017).

The Core Issue and A New Idea

The encroaching presence of robotics and progressively more advanced technology is not a novel concept. The duality of creating a surplus of jobs while simultaneously displacing hundreds of other jobs has been seen over time as we have progressed to the 21st century. These increasingly smart and adaptive robots are not inherently the issue. The true issue in the benefits that these robots have to society and who has control over it – such as Amazon. Thus, the issue becomes distribution rather than automation (Business Insider).

"Robots will never be our masters, but those who own them will be." – Calestous Juma, Professor at Harvard Kennedy School

The breakdown of the issue of automation in this manner sheds a new light onto what potential solutions should be aiming towards. When corporations were first put together, they did not consider the employees as stakeholders – thus creating a fundamental difference between socialism and capitalism. However, Silicon Valley broke this traditional model by introducing the idea of employee stock options. This basically gave the employees a vested interest in the performance of the company and vice versa as the companies also had a more direct incentive to keep employees happy and working hard. The last demographic that companies have to incorporate as stakeholders are users. Fuller attempts to bridge this gap through compensation for user data; however, this stops just short of a substantive policy proposal. The best way to create a substantial policy that will allow citizens to maintain a high standard of living while also ensuring the prosperity of the nation is through a completely new idea – inclusive stakeholding.

Inclusive Stakeholding

The Yun Family has invested itself in understanding the development of our societal structure today and how to use historic trends to our advantage when thinking about future issues. Joon Yun, Jeremy Yun, and Conrad Yun wrote a book called Redesigning the Social Contract through Inclusive Stakeholding: Interdependent Capitalism. This book breaks down how humans have globalized and what this has done to the traditional forms of society. The book further explores how the alignment of incentives and interests could be the solution for creating a better economic system for all.

"The arc of human history has been a struggle to update the inclusive fitness of the kin tribe era with the inclusive stakeholding of the global era." – Joon Yun, Principal of the Yun Family Foundation

They specifically analyzed traditional kin relationships within a tribe or community and how that inclusive spirit of overall success slowly diminished as our "tribes" became increasingly spread out. "Today, we rely much more on strangers who have an incentive to put their own interests ahead of ours. When those entrusted to serve us do not have kin skin in the game, exclusive stakeholding ensues (Markets Insider). Eric Yun, the director of the Yun Family Foundation, described the importance of investing in one another and using each other's success as a measurement of our own self-worth and contribution. He gives the example of teachers and healthcare workers as occupations to help illustrate how investing in one another could simultaneously help us and the nation as whole. For example, what is if a healthcare worker is rewarded based on a patient's healthcare savings in the future. In this regard the healthcare worker would genuinely want to help his/her patients not just to complete the tasks of his/her job but also because know the healthcare worker has a personal interest in the long-term health of the

patient. Similarly, suppose a teacher was rewarded based on his/her student's contribution to the world ten to twenty years down the road. This idea would be able to become concrete through the incorporation of advanced technologies such as blockchain. The machine learning algorithms could use the success of users, rather than profit maximation, as the basis for determining compensation amounts to occupations such as teachers and healthcare workers.

By understanding human's innate desire to compete we can create a policy that aligns incentives for people to race to an overall success rather than the bottom line. This also directly hits the core of the issue in makes everyone equally impacted by the success and failures of others. This helps to stop the power from becoming consolidated in the hands of top company executives. Inclusive stakeholding is a redesigned distribution system that focuses on removing the burden of financial constraints and instead empowers citizens for the long run.

Implementation:

Bruce Ackerman and Anne Alstott dive into why stakeholding could be the long-term solution for elevating citizens to a renowned sense of ownership in a new world. Their vision is to create a world in which inheritance is not simply a form of familiar heritage but of citizenship. In Ackerman and Alstott's plan, each individual will receive an $80,000 stake from the government at age 21. This dividend is contingent on the individual graduates from high school and from there he/she can receive interest on the initial principal over the years. Additionally, the recipient must be free of crime and/or alterations with the law. The individual is to receive his/her money in four annual installments – after which it is completely up to him/her on what to spend the money on. Additionally, to ensure that the system pushes society towards a more inclusive and invested mindset – upon death the principal amount must be returned back to the government.

This concept of inclusive stakeholding directly addresses the issues inherent in our current social democracy, which is important in a society inching closer towards automation and further away from occupation defining self-worth. Currently, social democracy "pushes far too many human beings off the center stage of social life" (Redesigning Distribution). Social democracy rewards occupations and employees who are able to showcase tangible results from their work which ultimately portrays certain occupations, such as care takers, to be useless. This system also strips away freedom from workers who operate at the bottom of the economic ladder. In this economic system, low-skilled workers are forced to earn low wages for demeaning work which creates an unending cycle of decisions being influenced by financial constraints. Thus, social democracy makes dignity synonymous to paid work. This is idea of dignity being contingent on pain work is contradictory when applied to various classes. The upper to middle class do not have the same burdens when justifying their wealth – such as expecting to prove you are a productive citizen before being able to access your family inheritance. Inclusive stakeholding helps to even the playing field and bring these freedoms to the less-skilled laborers as well.

Ackerman and Alstott also address UBI as a form of distribution. A guaranteed income every year would be fine as a welfare program, as it would sustain basic necessities. However, this idea of inclusive stakeholding is aimed at empowering citizens and, in a world run by automation, allowing individuals to take control of their livelihood. Young adults can use inclusive stakeholding to shape their career paths and future based on their individual plans. For example, a 23-year old college graduate might want to go directly into a top-tier PhD program. Under a system of small, annual handouts she would not be able to fund a higher-education program. Instead with inclusive stakeholding she could take out a larger sum to pay upfront. This

idea of giving shares of the United States encourages young adults to think with a long-run state of mind and consider how to give back to their fellow citizens. This $80,000 stake encourages people to take responsibility for their actions and take charge of how they live their lives. The young adults could use the money as an investment in themselves or recklessly spend it all in a short time frame. This is ultimately their choice and they will be the ones to feel the benefits or consequences of their actions.

The ideas of Ackerman ad Alstott tie in with the visions of the Yun Family in that all members of the commonwealth should have the right to inherit from the success of pervious generations as a whole, rather than having to rely on arbitrary luck from being born into a rich family versus a poor family.

V. Conclusion

The methodology and extent of automation integration highly depends on the individual landscapes of various corporations. In order for companies to successfully adopt automation they need to critically look at their own operations and recognize what would truly help to improve worker efficiency and ultimate output. For example, a factory plant that uses walkie-talkies and binders of paper to communicate or check quality assurance could greatly benefit from digitized paper-based work procedures that could increase the efficiency and safety of the employees. At the end of the day employees will be excited for and want to embrace automation if it can help make their daily functions more efficient and less cumbersome. Automation technology can provide employees with the opportunity to take on more advanced jobs that focus on the higher-order, nuanced work that can actually challenge human employees. Ultimately, clear, and transparent dialogue between the company and employees that could be impacted by the

technology will allow humans to remain at the heart of operations and advance society. There are strong arguments for and against the rise of automation; however, the harsh reality is that this revolution is inevitable. Only with this acceptance and understanding will America be able to position itself and its citizens to embrace the change and reap the maximum benefits. It is imperative for governments to take deliberate action and tangible steps *today* to make sure that we do not let automation run our society. Ultimately, the technology is not the destiny. We still have the power to fix the potential issues of this revolution and instead create a cooperative society in which everyone benefits. The impact of the rise in automation depends on how the technology is adopted by individuals, a human-centric approach from employers, and policy responses to inherent shifts in societal structures and economic systems.

Biography

Neha A. Purandare was born in Cleveland, Ohio on September 16, 1997, and moved with her family to Dallas, Texas in 1999. She is majoring in Plan II Honors, Business Honors, and Finance. During her freshman year she interned for a small tech-start up in Austin, Texas. She spent her freshman year summer studying abroad in Buenos Aires, Argentina. As a sophomore she interned for Capital Strategies – a private wealth management firm. Her sophomore summer was spent in Los Angeles, California in which she worked for Wells Fargo as a Summer Investment Banking Analyst. Her junior year summer worked for Rothschild & Co. as a Summer Investment Banking Analyst in New York, New York. After graduation she will be moving to New York to start her career as an investment banking analyst at Rothschild & Co.

Works Cited

"Amazon.com, Inc. (AMZN) Stock Price, Quote, History & News." Yahoo! Finance, Yahoo!, 8 May 2020, finance.yahoo.com/quote/AMZN?p=AMZN.

Anandan, Tanya M. "Robotic Industries Association." Robotics Online, 18 Nov. 2019, www.robotics.org/content-detail.cfm/Industrial-Robotics-Industry-Insights/Human-Robot-Interaction-A-Team-Sport/content_id/8484.

Armour, Helen. "Sales Force Automation (SFA): Really Simple Systems CRM." Really Simple Systems, 20 July 2018, www.reallysimplesystems.com/blog/sales-force-automation/.

Autor DH. 2015. Why are there still so many jobs? The history and future of workplace automation. Journal of Economic Perspectives 29(3):3–30.

Best, Jo. "Robots and the NHS: How Automation Will Change Surgery and Patient Care." ZDNet, ZDNet, 19 Nov. 2018, www.zdnet.com/article/robots-and-the-nhs-how-automation-will-change-surgery-and-patient-care/.

Brad Smith, Carol Ann Browne. "Tech Firms Need More Regulation." The Atlantic, Atlantic Media Company, 10 Sept. 2019, www.theatlantic.com/ideas/archive/2019/09/please-regulate-us/597613/.

Broughton, Anne Claire. "How Marlin Steel Got Lean By Paying For Skills." Forbes, Forbes Magazine, 14 Mar. 2016, www.forbes.com/sites/thehitachifoundation/2016/03/14/how-marlin-steel-got-lean-by-paying-for-skills/.

Carey, Crystal. "How Amazon Automatically Tracks and Fires Warehouse Workers for 'Productivity.'" How Amazon Automatically Tracks and Fires Warehouse Workers for

‘Productivity,’ The Verge, 25 Apr. 2019, https://www.theverge.com/2019/4/25/18516004/amazon-warehouse-fulfillment-centers-productivity-firing-terminations.

Costa, Pedro Nicolaci da. “Robots Are Going to Take a Lot of Jobs - Here's What We Could Do about It.” Business Insider, Business Insider, 30 Apr. 2017, www.businessinsider.com/policy-responses-to-automation-and-robots-taking-jobs-2017-4.

Crawford, Kate, and Vlad Jole. “Anatomy of an AI System.” Anatomy of an AI System, 2018, anatomyof.ai/.

Day, Matt, and Benjamin Romano. “Amazon Has Patented a System That Would Put Workers in a Cage, on Top of a Robot.” The Seattle Times, The Seattle Times Company, 7 Sept. 2018, www.seattletimes.com/business/amazon/amazon-has-patented-a-system-that-would-put-workers-in-a-cage-on-top-of-a-robot/.

Desk, Area Development News. “Eyeware Producer Lowercase Opens Manufacturing Center In Brooklyn, New York.” Area Development, 20 Apr. 2017, www.areadevelopment.com/newsItems/4-20-2017/lowercase-brooklyn-army-terminal-new-york-city.shtml.

Easterlin, Richard. (1974). "Does Economic Growth Improve the Human Lot?: Some Empirical Evidence." In Nations and Households in Economic Growth: Essays in Honor of Moses Abramovitz. Eds. Paul A. David and Melvin W. Reder. New York

Erica Volini, Jeff Schwartz, Indranil Roy, Maren Hauptmann, Yves Van Durme, Brad Denny, Josh Bersin. From Jobs to Superjobs 2019 Global Human Capital Trends. Deloitte Insights, 2019, From Jobs to Superjobs 2019 Global Human Capital Trends,

www2.deloitte.com/us/en/insights/focus/human-capital-trends/2019/impact-of-ai-turning-jobs-into-superjobs.html.

Franklin, Neil. “Automation Will Lead to Greater Inequality Rather than Job Losses.” Workplace Insight, 5 Mar. 2018, workplaceinsight.net/automation-will-lead-greater-inequality-rather-job-losses/.

Frayne, David, and David Frayne is a writer and social researcher based at Cardiff University. “Automation Will Mark the End of Our Work-Obsessed Society.” The Guardian, Guardian News and Media, 24 Feb. 2016, www.theguardian.com/sustainable-business/2016/feb/24/automation-end-work-obsessed-society-dystopia-jobs.

Ghafourifar, Alston. “Automation Replaced 800,000 Workers, Then It Created 3.5 Million New Jobs: Alston Ghafourifar.” FEE Freeman Article, Foundation for Economic Education, 14 Sept. 2017, fee.org/articles/automation-replaced-800-000-workers-then-it-created-35-million-new-jobs/.

Gohd, Chelsea, and Jolene Creighton. “Experts Might Have an Alternative to Basic Income.” World Economic Forum, www.weforum.org/agenda/2017/11/experts-might-have-an-alternative-to-basic-income/.

Itu. “A Fair 'Fourth Industrial Revolution'? 4 Key Challenges.” ITU News, 3 May 2018, news.itu.int/a-fair-fourth-industrial-revolution-4-key-challenges/.

Itu. “Four Ways Governments Can Ensure Tech Boosts Development.” ITU News, 2 May 2018, news.itu.int/four-key-actions-governments-can-take-to-promote-the-use-of-icts-to-achieve-the-sustainable-development-goals/.

Kestenbaum, David. “Keynes Predicted We Would Be Working 15-Hour Weeks. Why Was He So Wrong?” NPR, NPR, 13 Aug. 2015, www.npr.org/2015/08/13/432122637/keynes-predicted-we-would-be-working-15-hour-weeks-why-was-he-so-wrong.

Keynes, John Maynard. ([1930] 1972). "Economie Possibilities for Our Grand children."

Krieger, U.S. State Department’s first representative to Silicon Valley, said that companies are left to fill a void of understanding how to implement and regulate new technology as a product of policymaker’s lack of understanding.

Lebergott, Stanley. (1993). Pursuing Happiness: American Consumers

Lecher, Colin. “How Amazon Automatically Tracks and Fires Warehouse Workers for 'Productivity'.” The Verge, The Verge, 25 Apr. 2019, www.theverge.com/2019/4/25/18516004/amazon-warehouse-fulfillment-centers-productivity-firing-terminations.

Liao, Shannon. “Amazon Warehouse Workers Skip Bathroom Breaks to Keep Their Jobs, Says Report.” The Verge, The Verge, 16 Apr. 2018, www.theverge.com/2018/4/16/17243026/amazon-warehouse-jobs-worker-conditions-bathroom-breaks.

Lin, C.-Y. Cynthia. “An Evaluation of Keynes's Projected Possibilities.” The American Journal of Economics and Sociology, vol. 67, no. 2, 2008, pp. 315–330. JSTOR, www.jstor.org/stable/27739706. Accessed 12 Apr. 2020.

“M&A Activity In Artificial Intelligence Up 7x Since 2011.” CB Insights Research, 8 June 2017, www.cbinsights.com/research/artificial-intelligence-mergers-acquisitions-

exits/?utm_source=CB+Insights+Newsletter&utm_campaign=5a4d06d24b-MondayNL_6_20_2016&utm_medium=email&utm_term=0_9dc0513989-5a4d06d24b-87538037

NASEM [National Academies of Sciences, Engineering, and Medicine]. 2017. Information Technology and the US Workforce: Where Are We and Where Do We Go from Here? Washington: National Academies Press.

Peter Evans-Greenwood, Harvey Lewis, and Jim Guszcza, "Reconstructing work: Automation, artificial intelligence, and the essential role of humans," Deloitte Review 21, July 31, 2017

Quora. "Automation Will Dramatically Change The Workforce. Andrew Yang Has A Plan To Bridge The Gap." Forbes, Forbes Magazine, 27 Sept. 2019, www.forbes.com/sites/quora/2019/09/27/automation-will-dramatically-change-the-workforce-andrew-yang-has-a-plan-to-bridge-the-gap/#74f1102e204b.

Redesigning Distribution - University of Wisconsin–Madison. www.ssc.wisc.edu/~wright/Redesigning Distribution v1.pdf.

Reid, Jennifer. "How Oracle, Salesforce.com and IBM Are Fuelling the Marketing Automation Revolution." Clevertouch, Clevertouch, 2 Apr. 2020, clever-touch.com/how-oracle-salesforce-com-and-ibm-are-fuelling-the-marketing-automation-revolution.

Robots, Mobile Industrial. "Please Select Language." MiR at Whirlpool | Mobile Industrial Robots, www.mobile-industrial-robots.com/en/insights/case-studies/fleet-of-mir200-robots-at-whirlpool/.

Roschelle, Jeremy, and Stephanie D. Teasley. “The Construction of Shared Knowledge in Collaborative Problem Solving.” SpringerLink, Springer, Berlin, Heidelberg, 1 Jan. 1995, link.springer.com/chapter/10.1007/978-3-642-85098-1_5.

Rothfeder J. 2017. At Toyota, the Automation Is Human-Powered. New York: Fast Company.

Roy, Abhishek. “Universal Basic Income: Empirical Studies.” Sevenpillarsinstitute.org, Oct. 2016, sevenpillarsinstitute.org/universal-basic-income-empirical-studies/.

Salehi-Isfahani, Djavad, Mostafavi-Dehzooei, Mohammad. “Cash Transfers and Labour Supply: Evidence From a Large-Scale Program in Iran.” Economic Research Forum, Working Paper No. 1090, 2017, http://erf.org.eg/publications/cash-transfers-and-labor-supply-evidence-from-a-large-scale-program-in-iran/.

Shah, Agam. “Factory Workers Become Coders as Companies Automate.” The Wall Street Journal, Dow Jones & Company, 17 May 2019, www.wsj.com/articles/factory-workers-become-coders-as-companies-automate-11558085401.

“Top 10 Ways Salesforce Powers the 4th Industrial Revolution for the Energy Industry.” Opportune, 1 June 2019, opportune.com/Energy-Sector-Insights-Events/Insights/Top-10-Ways-Salesforce-Powers-the-4th-Industrial-Revolution-for-the-Energy-Industry/.

"To 2024, Robotic Process Automation Market to see 20% CAGR." Market Watch, 5 Oct. 2018, www.marketwatch.com/press-release/to-2024-robotic-process-automation-market-to-see-20-cagr-2018-10-05.

“Universal Basic Income: The Answer to Automation? (INFOGRAPHIC).” Futurism, Futurism, 12 May 2016, futurism.com/images/universal-basic-income-answer-automation.

Wachs J.P. (2012) Robot, Pass Me the Scissors! How Robots Can Assist Us in the Operating Room. In: Alvarez L., Mejail M., Gomez L., Jacobo J. (eds) Progress in Pattern Recognition, Image Analysis, Computer Vision, and Applications. CIARP 2012. Lecture Notes in Computer Science, vol 7441. Springer, Berlin, Heidelberg

Whittle, Lawrence. "Amazon's Automation Overreach." StackPath, 5 Sept. 2019, www.industryweek.com/technology-and-iiot/article/22028191/amazons-automation-overreach.

Wingfield N. 2017. As Amazon pushes forward with robots, workers find new roles. New York Times, September 10.

"Yun Family Foundation Announces the Publication of a New Book, Interdependent Capitalism: Redesigning the Social Contract through Inclusive Stakeholding | Markets Insider." Business Insider, Business Insider, markets.businessinsider.com/news/stocks/yun-family-foundation-announces-the-publication-of-a-new-book-interdependent-capitalism-redesigning-the-social-contract-through-inclusive-stakeholding-1027998585.